

**CLAIMS**

I claim:

1. A method of producing a volumetric ultrasound image, comprising:  
using a two-dimensional array transducer to scan a region of interest in an azimuthal direction using a plurality of beams that have a common center axis, the beams diverging in an elevational direction in respective divergence angles that are different for each beam, the beams scanning respective ranges of scanning depths that are ordered inversely to an order of divergence angles of the beams so that a beam scanning the shallowest range of scanning depths has the largest divergence angle and a beam scanning the deepest range of scanning depths has the smallest divergence angle;

projecting ultrasound reflections in each beam onto a common plane of projection, the reflections obtained for each beam being in the respective range of scanning depth; and

creating the volumetric ultrasound image from the ultrasound reflections projected onto the common plane of projection for all of the beams.

2. The method of claim 1 wherein all of the beams have substantially the same dimension in the elevational direction at the maximum depth in their respective ranges of scanning depths.

3. The method of claim 1 wherein the volumetric ultrasound image is created in real time.

4. The method of claim 1, further comprising:  
using the two-dimensional array transducer to perform a three-dimensional scan of a portion of the region of interest;  
creating a three-dimensional ultrasound image from the three-dimensional scan; and  
overlaying the three-dimensional ultrasound image on the volumetric ultrasound image.

5. A method of producing a volumetric ultrasound image, comprising:  
using a two-dimensional array transducer to scan a region of interest in an azimuthal direction using a beam that diverges in an elevational direction, the beam scanning a plurality of ranges of scanning depths using respective divergence angles that are ordered inversely to the ranges of scanning depths so that when the beam scans the shallowest range of scanning depths it has the largest divergence angle and when the beam scans the deepest range of scanning depths it has the smallest divergence angle;

projecting ultrasound reflections at each range of scanning depths onto a plane of projection; and

creating the volumetric ultrasound image from the ultrasound reflections projected onto the plane of projection.

6. The method of claim 5 wherein the beam has substantially the same dimension in the elevational direction at the maximum depth in each of the ranges of scanning depths.

7. The method of claim 5 wherein the volumetric ultrasound image is created in real time.

8. The method of claim 5, further comprising:  
using the two-dimensional array transducer to perform a three-dimensional scan of a portion of the region of interest;  
creating a three-dimensional ultrasound image from the three-dimensional scan; and  
overlaying the three-dimensional ultrasound image on the volumetric ultrasound image.

9. An ultrasound diagnostic imaging system comprising:  
a two-dimensional array transducer;  
a beamformer coupled to the two-dimensional array transducer to beamform received ultrasound echo signals;

a controller coupled to the two-dimensional array transducer, the controller controlling the two-dimensional array transducer to scan a region of interest in an azimuthal direction using a plurality of beams that have a common center axis, the beams diverging in an elevational direction in respective divergence angles that are different for each beam, the controller causing the beams to scan respective ranges of scanning depths that are ordered inversely to an order of divergence angles of the beams so that a beam scanning the shallowest range of scanning depths has the largest divergence angle and a beam scanning the deepest range of scanning depths has the smallest divergence angle;

a processor processing the beamformed ultrasound echo signals and projecting ultrasound echoes scanned by each beam onto a common plane of projection, the ultrasound echoes scanned by each beam being in the respective range of scanning depth; and

a display subsystem coupled to the processor, the display subsystem creating a volumetric ultrasound image from the ultrasound echoes projected onto the plane of projection for all of the beams.

10. The system of claim 9 wherein the controller controls the two-dimensional array transducer so that all of the beams have substantially the same dimension in the elevational direction at the maximum depth in their respective ranges of scanning depths.

11. The system of claim 9 wherein the volumetric ultrasound image is created in real time.